इंटरनेट मानक

Disclosure to Promote the Right To Information

Whereas the Parliament of India has set out to provide a practical regime of right to information for citizens to secure access to information under the control of public authorities, in order to promote transparency and accountability in the working of every public authority, and whereas the attached publication of the Bureau of Indian Standards is of particular interest to the public, particularly disadvantaged communities and those engaged in the pursuit of education and knowledge, the attached public safety standard is made available to promote the timely dissemination of this information in an accurate manner to the public.

“जानने का अधिकार, जीने का अधिकार”
Mazdoor Kisan Shakti Sangathan
“The Right to Information, The Right to Live”

“पुराने को छोड नये के तरफ”
Jawaharlal Nehru
“Step Out From the Old to the New”

IS 9541 (1987): Cast CTC Segments [MTD 14: Foundry]

“ज्ञान से एक नये भारत का निर्माण”
Satyanarayan Gangaram Pitroda
“Invent a New India Using Knowledge”

Act Number 22 of 2005
The Indian Parliament
RIGHT TO INFORMATION

Made Available By
Public.Resource.Org

“ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है”
Bhartṛhari—Nītiśatakam
“Knowledge is such a treasure which cannot be stolen”

BLANK PAGE

BRUTUM FULMEN

IGNORANTIA JURIS NON EXCUSAT

PROTECTED BY COPYRIGHT

IS : 9541 - 1987
(Reaffirmed 2002)

Indian Standard

SPECIFICATION FOR CAST CTC SEGMENTS

(First Revision)

UDC 669·14·018·8 - 14 ; 663·952·7·031

© *Copyright* 1987

BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Gr 3 *October* 1987

IS : 9541 - 1987

Indian Standard

SPECIFICATION FOR CAST CTC SEGMENTS

(First Revision)

Steel Castings Sectional Committee, SMDC 20

Chairman	*Representing*
SHRI T. KUMAR	Steelcast Bhavnagar Pvt Ltd, Bhavnagar
Members	
SHRI A. K. BANERJEE	Heavy Engineering Corporation Ltd, Ranchi
SHRI J. N. SINGH (*Alternate*)	
SHRI M. K. BANERJEE	The Tata Engineering & Locomotive Co Ltd, Jamshedpur
SHRI A. R. HORE (*Alternate*)	
SHRI S. CHOUBEY	Steel Authority of India (Rourkela Steel Plant), Rourkela
SHRI S. K. MAZUMDAR (*Alternate*)	
SHRI S. K. BASU	M. N. Dastur & Co Pvt Ltd, Calcutta
SHRI V. N. SUNDARRAJAN (*Alternate*)	
SHRI V. P. BHATT	Shri Ramkrishna Steel Industries Ltd, Coimbatore
SHRI S. R. SHASTRY (*Alternate*)	
SHRI R. P. S. BURMEE	Uni Abex Alloy Products Ltd, Thane
SHRI A. K. MALLICK (*Alternate*)	
DEPUTY CHIEF MECHANICAL ENGINEER (SF), CLW, CHITTARANJAN	Ministry of Railways
DEPUTY DIRECTOR (MI), RDSO, CHITTARANJAN (*Alternate* I)	
CHEMIST & METALLURGIST (SF), CLW, CHITTARANJAN (*Alternate* II)	
SHRI D. GUPTA	Utkal Machinery Ltd, Sundergarh
SHRI GAJINDER SINGH (*Alternate*)	
DR K. KISHORE	National Institute of Foundry Forge Technology, Ranchi
DR P. K. PANDA (*Alternate*)	
SHRI T. R. MOHAN RAO	Directorate General of Technical Development, New Delhi
SHRI U. SEN (*Alternate*)	

(*Continued on page* 2)

© *Copyright* 1987
BUREAU OF INDIAN STANDARDS
This publication is protected under the *Indian Copyright Act* (XIV of 1957) and reproduction in whole or in part by any means except with written permission of the publisher shall be deemed to be an infringement of copyright under the said Act.

(*Continued from page* 1)

Members	*Representing*
SHRI R. RAMASWAMY	Mukand Iron & Steel Works Ltd, Bombay
SHRI S. HARIHARAN (*Alternate*)	
SHRI C. S. REDDY	Bharat Heavy Electricals Ltd, New Delhi
SHRI A. V. HARNE (*Alternate* I)	
DR G. VENKATARAMAN (*Alternate* II)	
SHRI R. N. SAHA	Directorate General of Supplies and Disposals, New Delhi
SHRI DARBARA SINGH (*Alternate*)	
SHRI S. D. SAIGAL	Ministry of Defence (DGI)
SHRI R. C. MATHUR (*Alternate*)	
SHRI N. K. SINGH	Kanthal India Ltd, Pune
SHRI S. S. GAJARE (*Alternate*)	
SHRI M. THIAGARAJAN	Investment and Precision Castings Ltd, Bhavnagar
SHRI B. M. TAMBOLI (*Alternate*)	
SHRI RAMESH P. VERMA	The Institute of Indian Foundrymen, Bombay
SHRI A. RADHAKRISHNAN (*Alternate*)	
SHRI V. S. VENKATANATHAN	Bharat Earth Movers, Kolar Gold Field
SHRI E. C. NARAYANAN (*Alternate*)	
SHRI K. RAGHAVENDRAN, Director (Struc & Met)	Director General, BIS (*Ex-officio Member*)

Secretary

SHRI S. K. GUPTA
Deputy Director (Metals), BIS

Quality Acceptance Standards for Steel Castings Subcommittee, SMDC 20 : 3

Convener	
SHRI T. KUMAR	Steelcast Bhavnagar Pvt Ltd, Bhavnagar
Members	
SHRI S. H. BAXI (*Alternate* to Shri T. Kumar)	
SHRI GAJINDER SINGH	Utkal Machinery Ltd, Sundergarh
SHRI P. KRISHNAMURTHY	Sivananda Steels Ltd, Madras
SHRI A. K. RASTOGI (*Alternate*)	
SHRI A. KRISHNASWAMY	Hindustan Motors Ltd, Thiruvellore
SHRI V. S. UMANATH (*Alternate*)	
SHRI V. L. POTNIS	The Institute of Indian Foundrymen, Bombay
SHRI J. RATNAKAR (*Alternate*)	
SHRI I. RAMARAO	Bharat Heavy Electricals Ltd
SHRI A. K. SHARMA (*Alternate* I)	
SHRI D. LAXMINARAYAN (*Alternate* II)	
DR G. VENKATARAMAN	Bharat Heavy Electricals Ltd, Trichirapalli
SHRI V. S. VENKATHNATHAN	Bharat Earth Movers, Kolar Gold Field

Indian Standard

SPECIFICATION FOR CAST CTC SEGMENTS

(First Revision)

0. FOREWORD

0.1 This Indian Standard (First Revision) was adopted by the Bureau of Indian Standards on 30 April 1987, after the draft finalized by the Steel Castings Sectional Committee had been approved by the Structural and Metals Division Council.

0.2 This standard was first published in 1980. While reviewing this standard the Committee decided to align its various clauses relating to residual elements, chemical composition, non-destructive testing and repair of castings with the recent standards of steel castings.

0.2.1 Particulars to be specified by the purchaser while ordering steel castings to this specification have been included in Appendix A.

0.3 CTC segments are used in CTC machines for the manufacture of CTC teas. The product has acquired its name from the manufacturing process namely, Crush, Tear and Curl.

0.4 This standard has been formulated in order to guide the manufacturers of CTC machines and the estate managers in the use of quality segments. Such rationalization in quality of CTC segments would eliminate the possibility of contamination of the CTC teas so produced, and would also retain the liquoring quality in the teas manufactured.

0.5 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard prescribes the requirements for cast CTC segments.

2. TERMINOLOGY

2.1 For the purpose of this standard, the following definitions shall apply.

---

*Rules for rounding off numerical values (*revised*).

2.2 Cast (Melt) — The product of any of the following:

a) One furnace heat, or

b) One crucible heat, or

c) A number of furnace or crucible heats of similar composition mixed in a ladle or tapped in separate ladles and poured simultaneously for making a casting.

2.3 Batch — A group of castings of one grade of material, cast from the same melt and heat treated together under identical conditions.

2.4 Segments — A centrifugally or statically cast product, made out of specified material (*see* **6**) and machined subsequently to requisite size.

2.5 Nominal Size — Nominal size of the segments includes outside diameter (OD), inside diameter (ID), and height (H) in machined condition in the same order, that is OD × ID × H.

3. GRADES

3.1 This standard covers the requirements of two grades of castings.

4. SUPPLY OF MATERIAL

4.1 General requirements relating to the supply of cast CTC segments shall be as laid down in IS : 8800-1986*.

5. MANUFACTURE

5.1 The steel for the castings shall be made by electric arc, electric induction or such other processes as may be agreed between the purchaser and the manufacturer.

6. CHEMICAL COMPOSITION

6.1 The ladle analysis of steel when carried out either by the method specified in IS : 228† and its relevant parts or any other established instrumental/chemical methods shall be as given in Table 1. In case of dispute the procedure given in IS : 228† and its relevant parts shall be the referee method. However, where the method is not given in IS : 228† and its relevant parts, the referee method shall be agreed to between the purchaser and the manufacturer.

6.1.1 In the interest of uniform welding the limit for copper as 0·30 percent (*Max*), may be specified by the purchaser.

---

*Technical delivery conditions for steel castings (*second revision*).

†Methods for chemical analysis of steels (*second revision*) (issued in various parts).

6.2 The manufacturer shall carry out analysis from a sample of each melt of steel and, if so specified by the purchaser at the time of enquiry and order, shall supply a test certificate of chemical analysis of the sample of steel for each melt.

6.3 Product Analysis — If specified at the time of enquiry and order, the product analysis shall be carried out from a broken tensile test piece or from a casting representing each melt. Drillings for analysis shall be taken not less than 6 mm beneath the surface and in such a manner as not to impair the usefulness of any castings selected. The permissible variation in product analysis from the limits specified in Table 1 shall be as given in IS : 6601-1972*.

6.4 Residual Elements — Residual elements not specified in Table 1 shall not ordinarily be added to the steel and all reasonable precautions shall be taken to prevent contamination from the scrap, etc, to keep them as low as practicable.

TABLE 1 CHEMICAL COMPOSITION OF CAST CTC SEGMENTS

(*Clauses* 6.1, 6.3 *and* 6.4)

CONSTITUENT	PERCENT, *Max*, EXCEPT WHERE RANGE IS SPECIFIED	
	Grade 1	Grade 2
Carbon	0·20	0·15
Manganese	2·50	1·0
Silicon	1·50	1·50
Nickel	8 0 – 12·0	1·0
Chromium	18·0 – 21·0	11·50 – 14·0
Molybdenum	0·50	0·50
Sulphur	0·04	0·04
Phosphorus	0·04	0·04

NOTE — For easy machining, sulphur content for Grade 1 may be allowed up to 0·2 percent, *Max*, if agreed to between the purchaser and the manufacturer at the time of enquiry and order.

7. WORKMANSHIP AND FINISH

7.1 The castings shall be accurately moulded in accordance with the pattern or the working drawings supplied by the purchaser with the addition of such letters, figures and marks as may be specified.

7.2 The purchaser shall specify the tolerances on all important dimensions. On other dimensions, in case of unmachined castings and machined castings (whether in proof machined condition or in fully machined condition) the tolerances specified in IS : 4897-1986* and IS : 2102-1969†, respectively shall apply.

---

*Deviations in chemical composition for product analysis of steel castings.

8. FREEDOM FROM DEFECTS

8.1 All castings shall be free from defects that will adversely affect machining and utility of castings.

8.2 When necessary to remove risers or gates by flame or arc or a combination thereof, or by any other process involving intense heat, care shall be taken to make the cut at a sufficient distance from the body of the casting so as to prevent any defect being introduced into the casting due to local heating. Any such operation is preferably done before heat treatment.

8.3 In the event of any casting proving defective from foundry causes in the course of preparation, machining or erection, such castings may be rejected notwithstanding any previous certificate of satisfactory testing and/or inspection.

9. FETTLING AND DRESSING

9.1 All castings shall be properly fettled and dressed, and all surfaces shall be thoroughly cleaned.

10. HEAT TREATMENT

10.1 All castings shall be supplied in heat-treated conditions to obtain the properties as specified in Table 2.

TABLE 2 MECHANICAL PROPERTIES

(*Clauses* 10.1, 11.1 *and* 11.2)

PROPERTIES	REQUIREMENTS	
	Grade 1	Grade 2
Tensile stress, MPa, *Min*	480	620
Yield stress, MPa, *Min*	210	450
Elongation, percent, *Min*	26	16
Brinell hardness, HB	140 – 185	175 – 225

---

*Deviations for untoleranced dimensions and mass of steel castings (*second revision*).

†Allowable deviations for dimensions without specified tolerances (*first revision*).

10.2 Unless otherwise agreed to between the purchaser and the manufacturer, the castings shall be given the following heat treatment:

Grade	*Heat Treatment*
1	Heat to 1 040°C *Min*, hold for sufficient time to heat casting to temperature, quench in water or rapid cool by other means so as to develop acceptable corrosion resistance
2	Heat to 950°C *Min*, air-cool and temper at 590°C *Min*.

10.3 Test pieces shall be heat-treated along with the castings they represent.

10.4 The relevant records of heat treatment shall be furnished to the purchaser, if so specified by the purchaser at the time of enquiry and order.

11. MECHANICAL TEST

11.0 The mechanical properties specified are those which are to be obtained from test bars cast either separately from or attached to the castings to which they refer. The test values so exhibited, therefore, represent the quality of steel from which the castings have been poured; they do not necessarily represent the properties of the castings themselves.

11.1 The tensile test shall be carried out in accordance with IS : 1608-1972*. The minimum tensile stress, yield stress and elongation shall be as specified in Table 2.

11.1.1 Should a tensile test piece break outside the middle half of its gauge length and the percentage elongation obtained is less than that specified, the test may be discarded at the option of the manufacturer and another test made from the sample selected representing the same cast and heat treatment batch.

11.2 Brinell Hardness Test — The requirements of Brinell hardness shall conform to those given in Table 2 when carried out in accordance with IS : 1500-1983†.

12. NON-DESTRUCTIVE TESTS

12.1 Non-destructive testing shall be applied if specified in the enquiry and order. When specified, the castings shall be examined as follows:

a) Radiographic examination (*see* IS : 2595-1978‡).

b) Magnetic particle examination (*see* IS : 3703-1980§),

---

*Method for tensile testing of steel products (*first revision*).

†Brinell hardness test for metallic materials (*second revision*).

‡Code of practice for radiographic testing.

§Code of practice for magnetic particle flaw detection (*first revision*).

c) Liquid penetrant examination (*see* IS : 3658-1981*),

d) Ultrasonic examination (*see* IS : 7666-1975†).

NOTE — In case of austenitic grades, ultrasonic examination and magnetic particle examination would not ordinarily feasible.

12.2 The location, the percentage of quantity to be examined and the acceptance standard shall be agreed to between the purchaser and the manufacturer However, in case of ultrasonic examination, liquid penetrant examination and magnetic particle examination, IS : 9565-1986‡, IS : 11732-1986§ and IS : 10724-1983|| respectively, shall be taken as acceptance standards.

13. REPAIR OF CASTINGS BY WELDING

13.1 Unless otherwise specified by the purchaser in the enquiry and order, the castings may be rectified by welding without the previous permission, of the purchaser.

13.2 All repairs by welding shall be carried out in accordance with the procedure laid down in IS : 5530-1987¶. If castings have been subjected to non-destructive testing by agreement between the purchaser and the manufacturer, the castings shall be re-examined in the area of repair following any rectifying operation performed on the castings. If specified in the enquiry and order, a record of the weld repair carried out shall be furnished by the manufacturer to the purchaser.

13.2.1 Unless otherwise agreed upon, castings shall be heat treated after any major welding operation.

13.3 To form the basis of an agreement between the purchaser and the supplier where relevant, the following classification shall apply considering the extent of repair:

i) Weld repair involving a depth not exceeding 20 percent of the wall thickness of 25 mm, whichever is lower, shall be termed as a minor repair.

ii) Any weld repair exceeding the above shall be termed as a major repair. Further, any single repair having an area exceeding 250 sq mm for every mm of wall thickness shall also be deemed to be a major repair, regardless of the considerations mentioned in sub-para (i).

---

*Code of practice for liquid penetrant flaw detection (*first revision*).

†Recommended procedure for ultrasonic examination of ferrite castings of carbon and low alloy steel.

‡Acceptance standards for ultrasonic inspection of steel castings (*first revision*).

§Acceptance standards for dye penetrant inspection of steel castings.

||Acceptance standards for magnetic particle inspection for steel castings.

¶Code of procedure for repair and rectification of steel castings by metal arc welding process.

14. MACHINING

14.0 The machining of the segment shall be carried out in the following sequence. However, if agreed upon between the purchaser and the manufacturer, the part or whole of the machining may be carried out at the purchaser's end.

14.1 Turning — Segment shall be turned to blank with finished size (*see* Fig. 1).

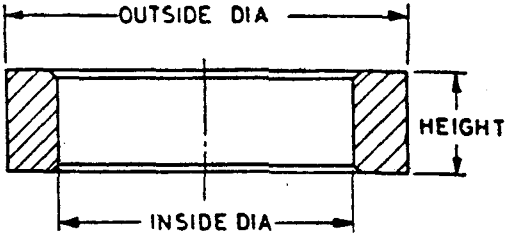

FIG. 1 BLANK TURNED TO FINISH DIMENSIONS

14.2 Chasing — The blanks then shall be chased to form parallel grooves to suit the manufacture of CTC teas required (*see* Fig. 2).

14.3 Milling — Thereafter, the blanks shall be grooved by helical milling with different depth ratios to suit individual requirements of the users in the manufacture of required grade of teas (*see* Fig. 3).

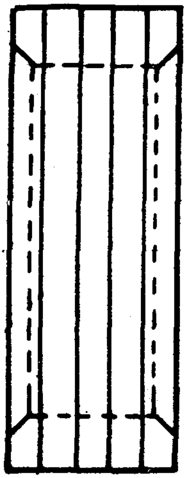

FIG. 2 CHASING

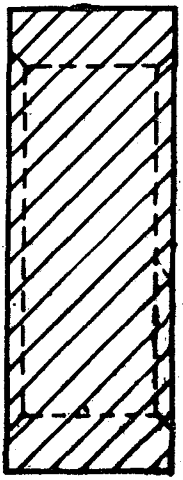

FIG. 3 MILLING

15. SAMPLING

15.1 The methods of sampling the steel castings for the purpose of chemical analysis and mechanical tests including retest shall be in accordance with IS : 6907-1973*.

16. MARKING

16.1 Each casting shall be legibly marked with the following:

a) Grade of the casting,

b) The number or identification mark by which it is possible to trace the melt and the heat treatment batch from which it was made, and

c) The manufacturer's initials or trade-mark.

16.2 By agreement between the purchaser and the manufacturer, castings complying with the requirements of this standard shall, after inspection, be legibly marked with an acceptance mark.

16.2.1 The castings may also be marked with the Standard Mark.

NOTE — The use of the Standard Mark is governed by the provisions of the Bureau of Indian Standards Act, 1986 and the Rules and Regulations made thereunder. The Standard Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by BIS and operated by the producer. Standard marked products are also continuously checked by BIS for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the Standard Mark may be granted to manufacturers or producers, may be obtained from the Bureau of Indian Standards.

APPENDIX A

(*Clause* 0.2.1)

INFORMATION TO BE SUPPLIED BY THE PURCHASER

A-1. BASIS FOR ORDER

A-1.1 While placing an order for the purchase of steel castings covered by this standard the purchaser should specify the following:

a) Material specification;

b) Drawing or reference number of the pattern (if supplied by the purchaser), along with a copy of the drawing;

c) Tests required;

d) Whether the castings are to be inspected and tested in the presence of the purchaser's representative;

e) Condition of delivery;

f) Any special requirements; and

g) Test reports, if required.

---

*Methods of sampling of steel castings.